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MULTICHIP MODULE HIGH SPEED TESTING

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Characterization of polymer films: Research has continued on the characterization of polymers for high speed interconnection circuits in multi-chip modules. As an extension of our previous work on electro-optic response and sensitivity of poled side chain polymers, we have developed a new interferometric technique for measurements of the dielectric constant and loss over a frequency range from 10 GHz to over 3 THz.

The method we used is an extension of the recently developed terahertz spectroscopy. It consists of the generation of a very short electrical pulse into free space, which is then transmitted through the polymer sample, passed through a Fourier transform interferometer, and detected in a bolometer. The source of short electrical pulses used is a p-i-n diode illuminated by a femtosecond optical pulse. We have previously shown that this technique is a very effective method of generating sub-picosecond electrical pulses in free space. We are now beginning to apply this technique to the characterization of a number of polymer films. The extended frequency response of this capability will permit us to identify trace absorption in the polymer films and model the absorption mechanism. In the future, we plan to extend these measurements to metal-dielectric interfaces.

New Laboratory facilities: We have begun to move into our new building. This will provide greatly improved laboratory facilities for our work. A full clean room is being installed for fabrication of microelectronic and optolectronic devices. This

new facility will be an important resource for our work on interconnection circuits and materials for multi-chip modules. Progress on our research has been slowed during this period due to the move, which we expect will be completed in two weeks time.

New Personnel: A new junior faculty member in our Electrical Engineering department is being hired to work in the area of materials and processing for packaging. He will be an important resource for fabrication, processing, and testing of the materials and devices. In addition, two new students have been brought into this program.

Technical Publication and Presentations:

[1] P.M. Ferm, C. Knapp, C.-J. Wu, J.T. Yardley, B.B. Hu, X.-C. Zhang and D.H. Auston, "Femtosecond Response of Electrooptic Poled Polymers," Appl. Phys. Lett. **59**, 2651 (1991)

[2] P.M. Ferm, C. Knapp, C.-J. Wu, J.T. Yardley, B.B. Hu, X.-C. Zhang and D.H. Auston, "Ultrafast Electrooptic Effect in Poled Polymer Films," Optical Society of America Annual Meeting, San Jose, Nov. 7, 1991.

[3] P.M. Ferm, C. Knapp, C.-J. Wu, J.T. Yardley, B.B. Hu, X.-C. Zhang and D.H. Auston, "460 GHz Electro-optic Sampling Using A Nonlinear Polymer Film" CLEO 92, Anaheim, May. 10, 1992.